ISSUE: FEBRUARY 1997

LISTing Policy ..... Annual Dues $ 16.00

LISTings

Newsletter of the Long Island Sinclair / Timex Users' Group

NEXT LIST MEETING MARCH 9th, 1997

L.I.S.T. officers

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Tresurer	Robert Malloy
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Assoc. Editors	Fred Stern
	Harvey Rait
Publisher	Bob Gilder
Libr.	Tom Skapinski

Please send all inquiries and submissions (including dues) to: L.I.S.T.
Mr. Harvey Rait
5 Peri Lane,
Valley Stream, N. Y. 11581

COMING EVENTS: The next L.I.S.T. meeting will be Sunday 2/Ø9/'97 at 2 P.M. at the home of Harvey Rait (see address above).

From: Vic Avery. Head Librarian.
44 Redhill Park, Redhill Lane, Watton, Norfolk. IP25 6RE.
Tel/Fax; (01953)-882113. (Mobile 0802-674677)
My Ref: D7/SLib701 Jan.1997

To: All Sub Librarians,
(Copy to Software Controller),

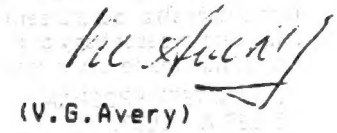
Ref: QUANTA LIBRARY - Update 97/01

Wishing you all a Happy New Year, with the latest update.
Enclosed are 19 disks in total - Yes 19 !!. The members have kept the QC very busy since our last update. There are 12 Replacement disks, plus 7 new Additions: (ED07 to ED11, CT 03 plus UG17), to your Library Disk Set.
You will note that UG17 is on a HIGH DENSITY disc. If your system is unable to handle this format, then please ask members who require copies to contact another Sub-Lib. or myself.
The Library Guide disk LG 01, has been updated, and includes these changes, and also some amendments to the _doc files.
The following is a summary of the changes made, for your information.

Disk No.	Action.
LG 01	Updated 97/01 (Please check your own details are correct).
CT 02	Addition of NET_PEEK (G.Gwilt)
CT 03	New Disk with QLINK (Bill Cable)
ED 07 to ED 11	5 New Disks with the CIA WORLD FACT BOOK (D. Jones).
GR 04	Add 3-DPIE (G. Wicks) which somehow got deleted in the past
GR 05	New Disk with LINEDESIGN files (R.Wood) also 'lost' from GR04 and LASSUS (J.Terry) added.
PS 07	Upgrade of IGItoAR (R.Kempton) and ARCHY (J.Terry) added.
UG 03	Addition of HMTL MACHINE (R. Wood)
UG 12	Upgrade of PHONELOG (M.Knight) Includes Videotron services
UG 13	Upgrade of FILE UTILITIES v 1.18 (M.Knight)
UG 15	Upgrade of UTILITIES (D. Cmelik).
UG 16	Upgrade of POINTER ENVIRONMENT KIT (R.Kempton)
UG 17	New HD Disc with ASSEMBLER (G.Gwilt).
UD 01	Addition of DISP2 (G.Gwilt) A compact listing prog.
UT 02	Addition of PEX (P.Recktenwald) A PE handler extension.

Once more our sincere thanks are due to John Gregory, the Quality Controller, for his work in checking and colating the programs prior to circulation. Also for his update notice which includes details of the new programs for members information, and should appear in the next issue of QUANTA.

My thanks to you all for your patience & continued support.
& Happy QL'ing . . . .
Regards,

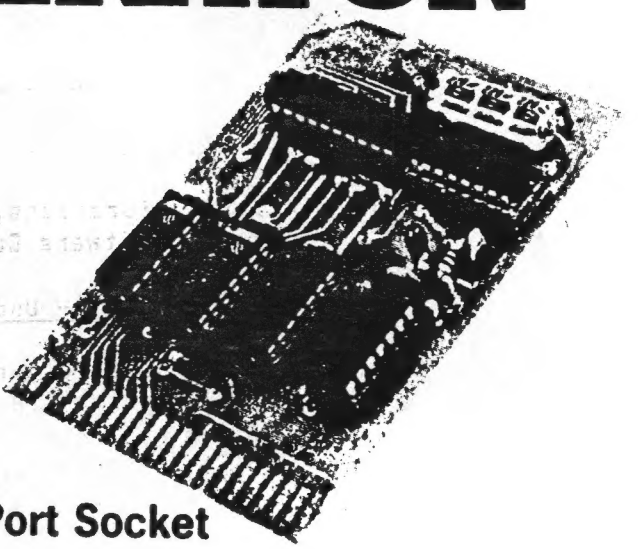


(V.G.Avery)
Quanta Head Librarian.

Please complete the receipt slip below and return it to the Head Librarian. (An address label is enclosed).
Please notify any change of address/Tel.No etc, if applicable.

SOUND GENERATOR for the ZX 81

by Dave Goodman



- ★ 3 Programmable Tone Generators
- ★ Noise Generator with 3 Pitch Levels
- ★ Separate Attenuators for Noise and Tone Generators
- ★ Entry from PEEK and POKE in BASIC
- ★ Connects Directly into the Expansion Port Socket (or into the motherboard)
- ★ Single Address Access

This sound generator is a worthy addition to our ZX81 hardware projects. Almost infinite possibilities for sound and noise effects that can be added to your own programs for greater realism.

Circuit Description

ICs 1, 2, and 3 are connected to the computer address lines A1 to A15. This means that all addresses up to 65534 may be presented, so a decoder is required to examine all lines, but only to respond to a particular address. The address code used here is 16370, which lies between the 16360 and 16380 used in our I/O port project. AØ is not used, so a further address of 16371 exists.

A negative going address decode pulse appears at the output of IC2, and is used to latch data into IC4 and enable IC6. To avoid corruption of data into IC6 the output of IC4 must be latched to the data code before IC6 is enabled.

Buffers IC5a and b delay the enable pulse just enough to allow IC4 to latch before enabling IC6. IC6 pin 4 READY line controls the duration of the WRITE ENABLE (pin 5) and CHIP ENABLE pulse for correct circuit operation, via IC5c. R1 and C1 smoothe the +5V supply, to keep noise spikes down to a minimum, and audio output is taken from IC6 pin 7, via low pass filter R3 and C2, to the output pins 1 and 2. IC5d buffers the 3.22MHz clock, and prevents lengthy track runs from crashing the ZX81.

Most important is D1. You may be aware that because of incomplete address decoding, the ZX81 ROM is repeated between address 8193 and 16383, which is an unused area between ROM and system variables. These addresses can be POKEd providing that the ROM is deselected at that time, and D1 conducts when A13 is high, freeing this area for use.

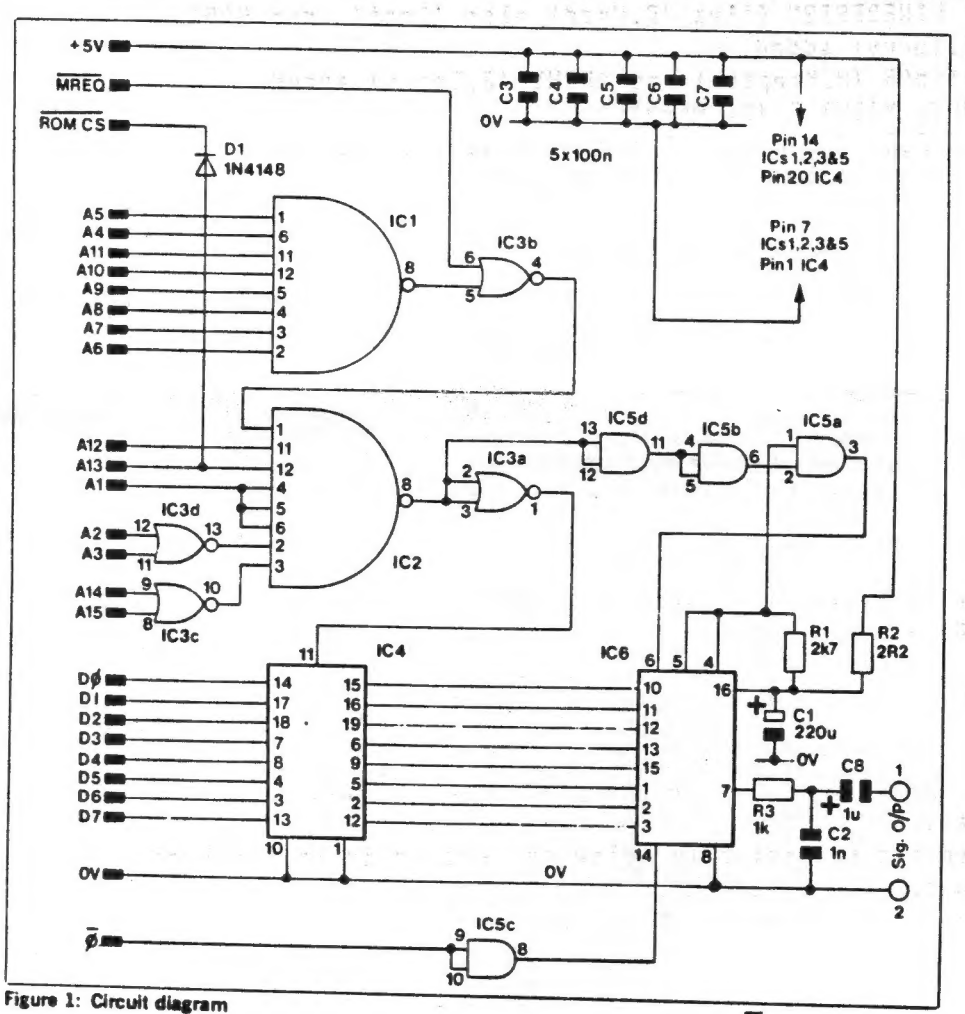


Figure 1: Circuit diagram

Assembly and Construction

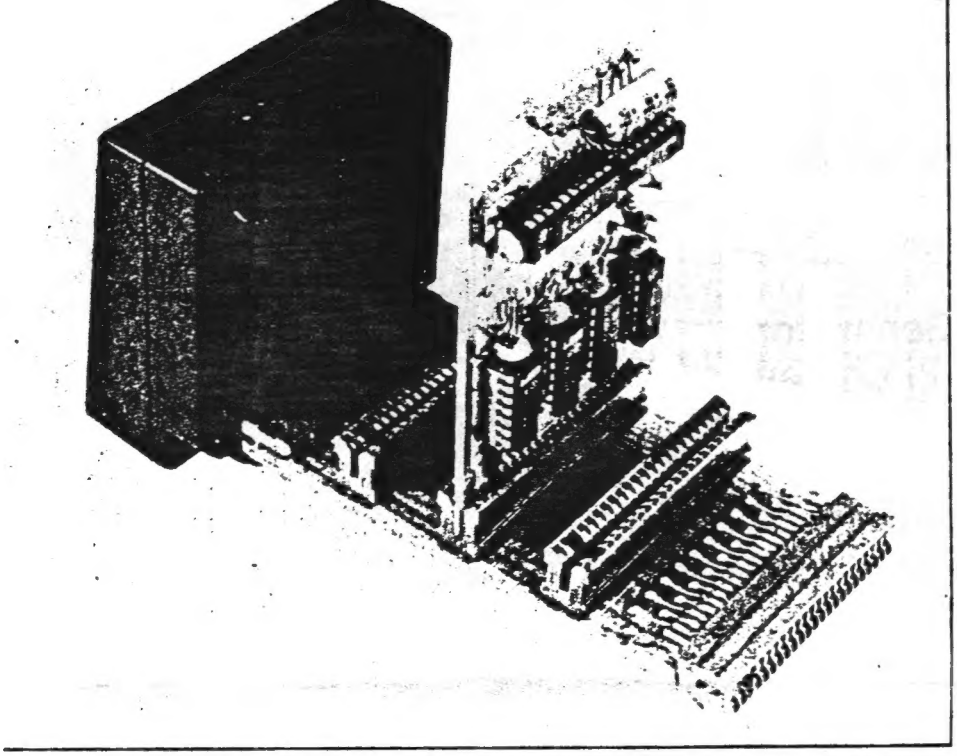
Insert all track pins and both vero pins. Fit all six DIL sockets, R1, 2, and 3 and C2. Fit disc ceramics C3 to C7 and C1 and C8 noting the polarity markings. Insert all ICs the correct way round, then clean the PCB and make the final inspection for short circuits and dry joints.

Testing and Use

If you do not possess a mother board you will require a 2 x 23 way socket to solder onto the PCB edge connector, otherwise plug into your motherboard. The signal is insufficient to drive a loudspeaker direct, as it is only 300mV in amplitude, so you will need an external amplifier and speaker connected to pins 1 (signal) and 2 (screen). Switch on the ZX81 and a cacophony of noise should be heard. Run the following test program:—

```
10 REM TEST PROGRAM
15 LET A = 16370
20 INPUT B
25 POKE A, B
30 GOTO 10
```

Press RUN then NEWLINE and input the following codes followed by NEWLINE after each code: 159 191 223 255 (you should hear the tones disappearing one by one until all the signals are off) 144 128 64. A low frequency tone of approximately 98Hz (G2)



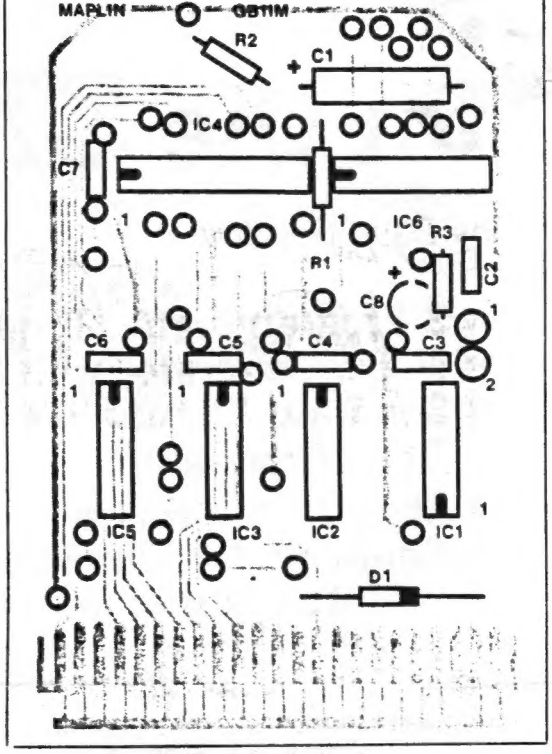


Figure 2: Overlay and artwork

TONE GENERATOR	ACCESS CODE	FREQUENCY RANGE	ATTENUATION CODE
1	128	64(G2) to 1(G8)	144 to 159 (OFF)
2	160	64(G2) to 1(G8)	176 to 191 (OFF)
3	192	64(G2) to 1(G8)	208 to 223 (OFF)
White Noise	228	High pitch	240 to 255 (OFF)
White Noise	229	Med. pitch	240 to 255 (OFF)
White Noise	230	Low pitch	240 to 255 (OFF)
Pulse (spike)	224	480Hz	240 to 255 (OFF)
Pulse (spike)	225	240Hz	240 to 255 (OFF)
Pulse (spike)	226	120Hz	240 to 255 (OFF)

should be heard. Any number between 1 and 64 may now be entered and the appropriate tone should be audible. Refer to the following listing for access codes and settings.

To input data into tone generator 1 only, first enter the required volume level from the attenuation codes. The first code given is maximum volume, e.g. Tone generator 1 = 144 and attenuation levels are in 15 x 2dB steps down to 159, which is fully off. Next enter the tone generator access code, which in this example is 128, followed by the required frequency. The frequency range covers 98Hz (G2) up to 6.3kHz (G8) in 64 steps, code 1 being the highest frequency and code 64 being the lowest, so enter 64. The entered codes are now 144, 128, 64, which is tone generator 1 producing an output of 98Hz at full volume. As a Tone Generator access code was entered after the attenuator, the frequency can be changed as desired, but if an attenuator code is now entered, 144 to 159 in this example, the frequency can only be altered by entering the access code, 128, again, and then a frequency code.

Keep in mind that when a register is accessed it will remain 'on line' awaiting further update input codes. Access to Tone Generators 2 and 3 is in the same manner, except that the codes are different. If you enter 144, 128; and 64 to set up a tone in Generator 1, then enter 176, 160 and 32. Two tones will now be heard, with Generator 2 an octave above Generator 1. Entering a frequency code will now only alter Generator 2.

Pulse and noise effects require attenuation codes and an access code only. Once the attenuation level has been set noise and pulse codes are entered and are immediately audible.

Tone Generator 3 can be used to control either noise or pulse registers and code 231 followed by 192 allows control of white noise pitch by entering 1 to 64. Similarly, code 227 followed by 192 allows control of a 480Hz pulse tone by entering 1 to 64, and the lowest frequency possible is 6Hz.

Obviously, the best way to understand the system is to use it, therefore a few simple programs are given for assistance, shown at the end of this article. When writing music programs remember that G2 to G8 spans 73 notes and control only covers 64 notes, therefore higher frequency notes tend to become sharper in relation to the lower octaves.

Run these programs in SLOW mode:—

```
10 REM ZMD878DMZ
   MD878DM182.*.2
   8ZMD878DMSMI
   EDFJMZMD878DM
15 LET A = 16370
20 LET B = 16514
25 FOR J = 1 TO 48
30 FOR I = 1 TO 15
35 NEXT I
40 POKE A, (PEEK B)
45 LET B = B+1
50 NEXT J
55 GOTO 10
```

Press break to stop sequence.

```
10 REM GUN SHOT
15 LET A = 16370
20 POKE A, 159
25 POKE A, 191
30 POKE A, 223
35 POKE A, 240
40 POKE A, 23
45 FOR J = 240 TO 255
50 POKE A, J
55 NEXT J
60 INPUT E$
65 GOTO 10
```

After RUN press NEWLINE to fire.

```
10 REM PHOTON BLAST
15 LET A = 16370
20 POKE A, 159
25 POKE A, 191
30 POKE A, 223
35 POKE A, 148
40 POKE A, 240
45 POKE A, 231
50 POKE A, 192
55 FOR J = 0 TO 30 STEP 2
60 POKE A, J
65 POKE A, 128
70 POKE A, J
75 POKE A, 192
80 NEXT J
85 POKE A, 159
90 POKE A, 228
95 POKE A, 247
100 INPUT C$
110 GOTO 10
```

Press NEWLINE to fire. To remove background hiss, delete line 90 and change line 95 to POKE A, 255.

ZX81 SOUND GENERATOR PARTS LIST

Resistors: All 0.4W 1% Metal Film

R1	2k0	(M2K7)
R2	2k2	(M2R2)
R3	1k	(M1K)

Capacitors

C1	220uF 10V axial electrolytic	(FB60Q)
C2	1nF ceramic	(WX68Y)
C3-7 Inc.	100nF minidisc	(YR75S)
C8	1uF 35V tantalum	5 off (WW60Q)

Semiconductors

D1	1N4148		(QL80B)
IC1,2	74LS30		(YF20W)
IC3	74LS02	2 off	(YF02C)
IC4	74LS373		(YH15R)
IC5	74LS08		(YF06G)
IC6	76489AN		(YH33L)

Miscellaneous

14 pin dil skt	4 off	(BL18U)
16 pin dil skt		(BL19V)
20 pin dil skt		(HQ77J)
Veropin 2141		(FL21X)
Track pin	1 pkt	(FL82D)
ZX81 Sound Gen. PCB		(GB11M)

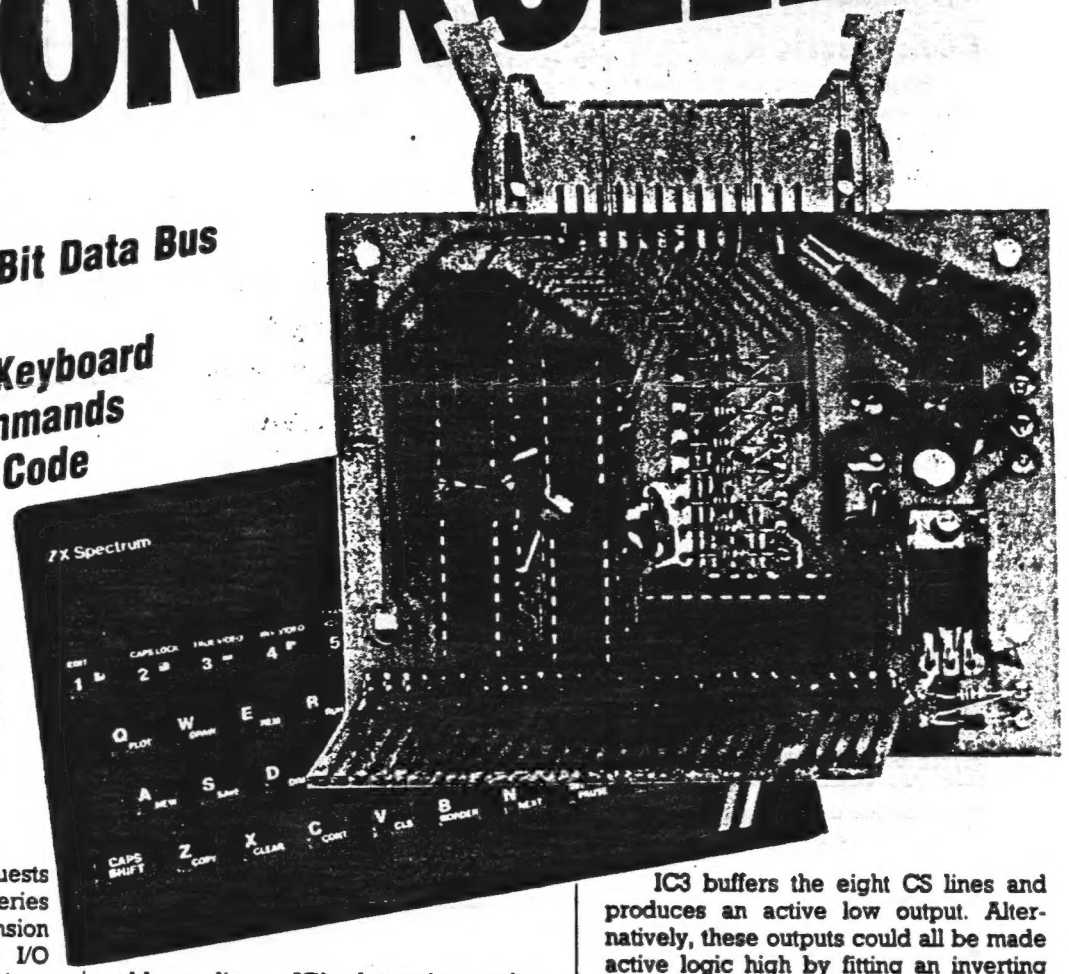
A complete kit of parts is available for this project. Order As LW96E (Sound Gen. Kit) Price £10.95.

For constructors who may wish to use the Sound Generator in addition to other external hardware, a mother board is available, called the ZX81 Extend! board (GB06J) and will accept the Sinclair 16k RAM pack and up to 3 plug-in modules. In addition to the PCB you will require 4 PC Edge Connectors (RK35Q)

SPECTRUM I/O CONTROLLER

by Dave Goodman

- Buffered 2 Way 8-Bit Data Bus
- 8 Control Lines
- Access Made Via Keyboard 'IN' and 'OUT' Commands or From Machine Code



Prompted by the many requests received from our customers for a series of interfaces allowing add-on expansion to the Spectrum computer, the I/O Controller module is offered to achieve this. Although not a programmable parallel/serial device in itself, the I/O Controller will decode 8 independant select control lines with data bus access via a bi-directional buffer. Buffered read and write lines are also available, thus establishing CPU protocol during I/O time.

It is intended that the controller be used with latch modules, serial interfaces and speech/sound generators which will be available from Maplin, designed as an expandable system to extend the Spectrum's capabilities. Of course, many other commercial add-on's could be controlled by this module, especially in the field of Robotics.

Circuit Description

The Z80 CPU IN/OUT accumulator instruction determines the state of the lower (A0 - A7) address bus. This effectively allows 256 input/output ports for use either from the keyboard or with machine code. Spectrum firmware uses A0 to A4 for printer, key scanning, cassette and sound functions leaving A5 to A7 free for use with suitably decoded address lines. IC1 determines when firmware is active and prevents the address decoder IC2 from being accessed. Assuming that a valid I/O Port address is presented, say 31, then the enable input of IC2 (pin 5) is taken low when A0 to A4 is logic high.

A5, 6 and 7 will be logic low, whereupon IC2 $\overline{\text{IORQ}}$ pin 4 is enabled and the decoded output appears on pin 15. There are eight select outputs (CS) from IC2, but only one may be accessed at any time. Address lines A5 to A7 determine which one of these CS outputs are active and Table 1 shows each I/O address associated with their respective control lines.

Select Line		Port I/O Address
(CS)	1	31
	2	63
	3	95
	4	127
	5	159
	6	191
	7	223
	8	255

Table 1

IC3 buffers the eight CS lines and produces an active low output. Alternatively, these outputs could all be made active logic high by fitting an inverting 74LS240 in place of IC3. A bi-directional data buffer, IC5, connects the Spectrum data bus to the port outputs for reading (PRD) and writing (PWR) operations. The PRD control line will not be active (logic 0) during the PWR sequence. Therefore, the data bus state always appears on the outputs of IC5 irrespective of correct port addresses being available or not! To read information in from the port, both $\overline{\text{IORQ}}$ and one of the eight CS lines must be active. IC4a OR's both of the enable signals producing a logic 0 to send to IC4b. When a logic 0 read signal is presented, IC5 switches the port data bus through to the Spectrum bus. This arrangement ensures isolation between the CPU and the outside world. The regulator, REG1, supplies the +5V for powering port electronics and is tapped into the Spectrum 9V PSU. Although a +5V regulated output has been brought out to the expansion connector, the current available is small. Additional loading of the internal regulator will increase heatsink temperature – and may cause overheating problems – especially on 48K machines with Interface 1 attached.

Facilities for connecting an external PSU have been added which connect to the IDC outlet for powering modules connected to the port. R9, D1 can be used as a power on/off sensing device and control to these devices – more on this later. Finally, the system RESET line is extended through so that the Spectrum can be externally reset, and/or periphals reset during power up. The reset line is active low, and reset occurs after a low to high transition has been initiated.

Construction

Begin construction by first fitting the 2 x 28 way Edge Connector into the PCB, (Figure 5). Insert the terminal pins from the track side, and *not* the legended component side. You will see a blank locating peg fitted in position 5 of the connector; line it up with the PCB so that it sits directly behind but on the opposite side to the bar on the legend. Do not cut off any of the connector pins as they are used for mounting an expansion PCB, as we shall see shortly. Carefully push every terminal pin through the PCB leaving a 4mm gap between the rear of the connector and the PCB. This allows for clearance when fitting the module into a box, otherwise not enough of the socket protrudes for insertion into the Spectrum. Make sure that both the PCB and the socket are at right angles to one another with an even 4mm gap along the back and solder all terminal pins to the PCB, on the component side! Each drilled hole has plated through connections joining the tracks on both sides of the board so it is only necessary to solder one side. Ensure the connector does not move whilst doing this as it can be quite difficult to straighten out afterwards.

Expansion PCB

The smaller expansion PCB can be fitted at this stage although it is not part of the port section. All address, data, control and supply lines found on the Spectrum connector are extended out with this board. Note that no buffering or port outputs are available from here, just direct connections. Figure 5 shows all relevant details. In position 5 on both edges of this PCB, there are slots cut for alignment purposes. Insert the PCB between both rows of connector pins standing out from the main PCB with the slot against the legend bar. Gently bend all 54 terminal pins towards the expansion PCB until it is self supporting at right angles to the main PCB and solder each pin to the relevant track. Clean off surplus flux with brush and thinners and inspect every solder joint made so far. There must not be any short circuits between tracks or terminals; otherwise damage may occur to the Spectrum when running the port! As an extra precaution, use an ohmeter or multimeter set to measure resistance and test for shorts between adjacent tracks across and between both sides of the expansion PCB. A little time spent carefully checking at this stage is likely to prevent major headaches later on.

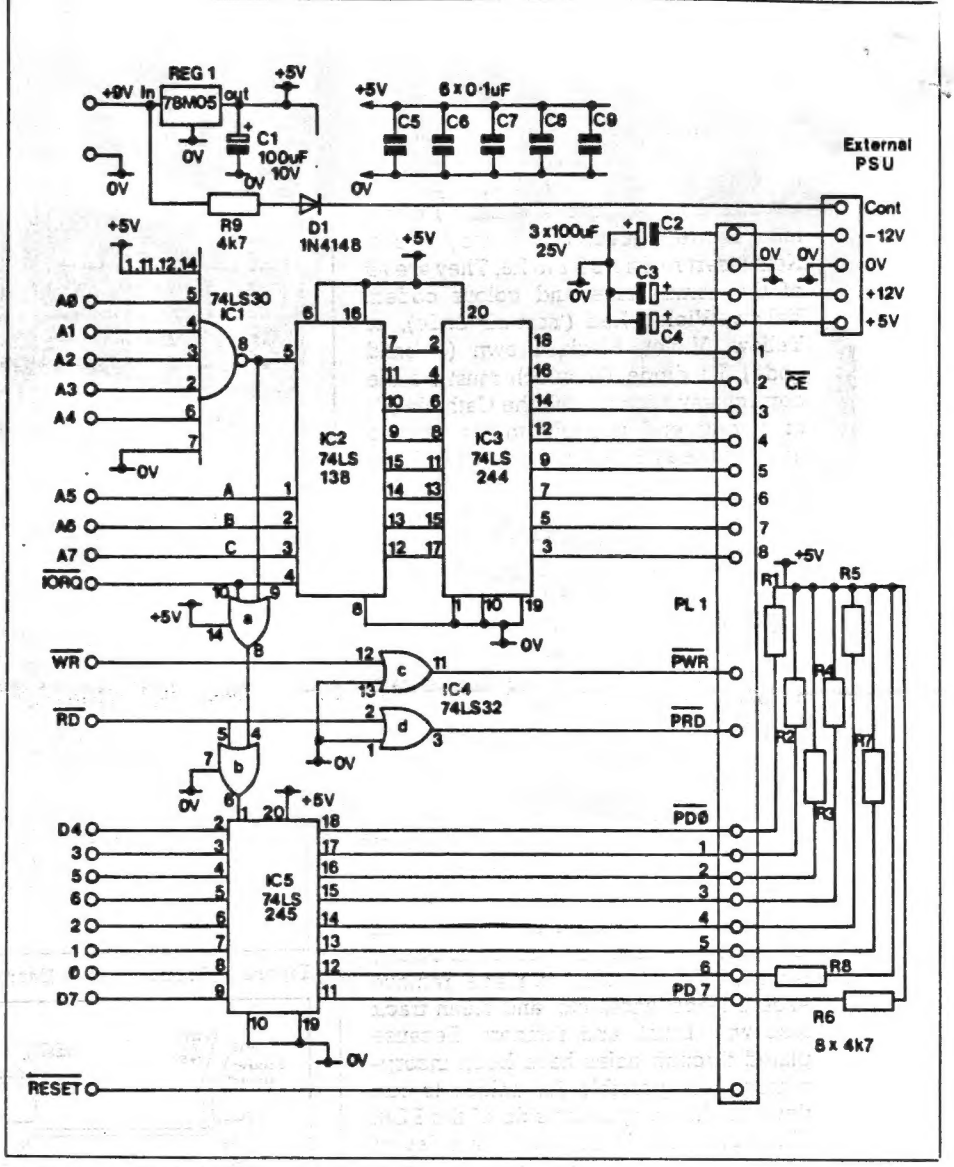


Figure 1. Circuit Diagram

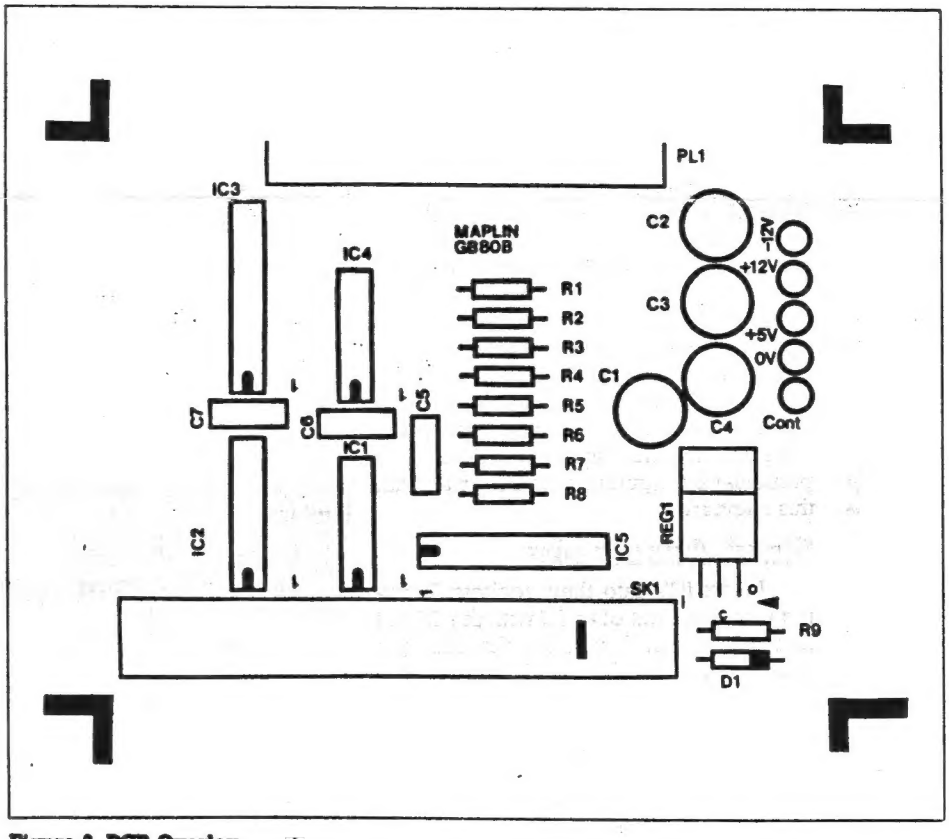


Figure 2. PCB Overlay

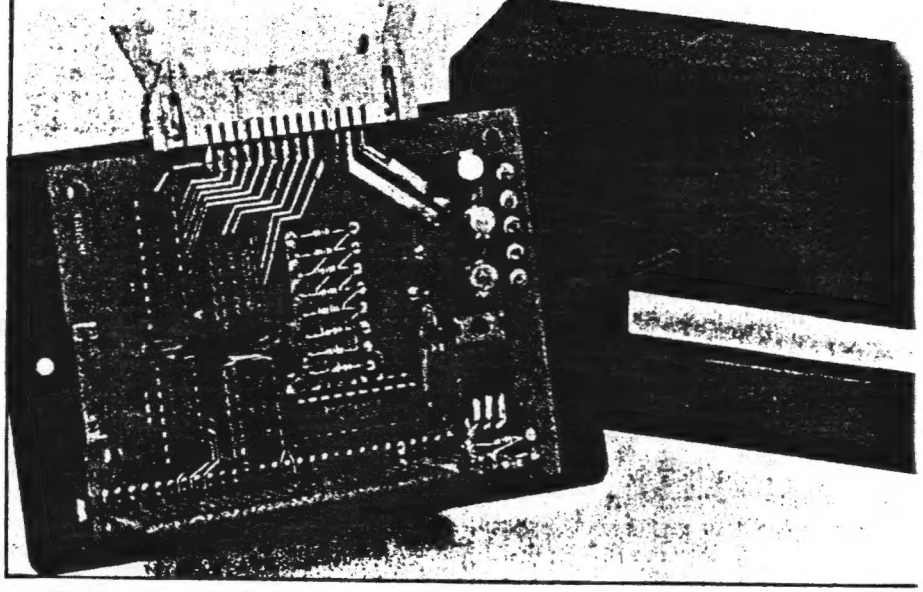
With reference to the Parts List and Figure 2, insert all five IC holders, noting that those for IC's 1 and 4 are 16 pin types, IC's 3 and 5 are 20 pin and IC2 is a 14 pin type. Push them down onto the PCB, then carefully solder each terminal in place. Mount C5, 6 and 7, which are circular disc capacitors, ensuring clearance between leads and nearby tracks. Next insert resistors R1 to R9. They are all of the same value and colour coded: Yellow, Violet, Red ('normal' code), or Yellow, Violet, Black, Brown (5 band code). Fit diode D1 which must be the correct way around with the Cathode (K) or ringed end pointing to the outside edge of the PCB. Align the band with the legend. Now insert capacitors C1, 2, 3 and 4. These electrolytic type capacitors are polarised and must only be fitted one way around. The case or negative end is designated with a −V sign on the package, or by the shortest of two leads. Unmarked or longest leads are then +V; insert according to the legend. Finally, the 3-pin regulator REG1 can be fitted with the flat side containing the heatsink bracket laying over a section of track on the PCB. Bend all 3 terminals downward, approximately 6mm away from the plastic body and locate each one through its mounting hole. This square of copper track beneath the regulator helps to dissipate heat radiated from the heatsink, although it is fairly insignificant. Solder remaining components in place, remove excess leads, wires etc, and clean track face with brush and thinners. Because plated through holes have been incorporated, it is possible for solder to run down to the component side of the PCB. Therefore, closely inspect both sides of the board, looking for short circuits and probable errors.

IDC Header

Every connection to and from the port is made via a 26-way IDC header plug. To fit this plug, slot the terminal pins over the PCB solder pads situated along the top edge, according to the diagrams of Figures 3 and 4. Arrange all terminals centrally to each pad and push the plastic body down onto the board edge. One side of the plug has a locating slot cut down it – arrange this facing outwards – which is situated on the track side of the PCB (same side as the 28-way socket!). Solder in place. It does not matter which side the slot faces, but Figure 4 notation is arranged for this particular configuration, so best stay with this standard.

Final Assembly

Insert IC's into their sockets. Looking from the front of an IC with the 'D' slot facing left, pin 1 will be the first pin beneath the slot. Be careful to observe this! Fit the 5 Vero pins by inserting them from the track side and gently push their heads down onto the track pad before soldering in position. Again, re-check all work done and when satisfied that all is well, proceed with testing the module.



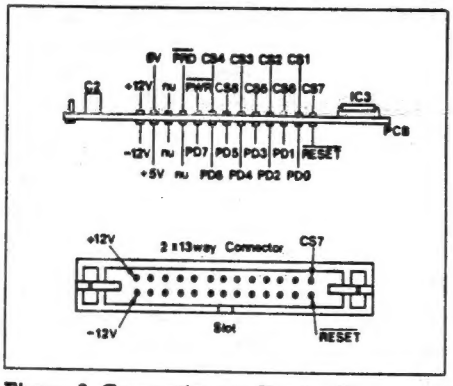


Figure 3. Connections to Header Plug

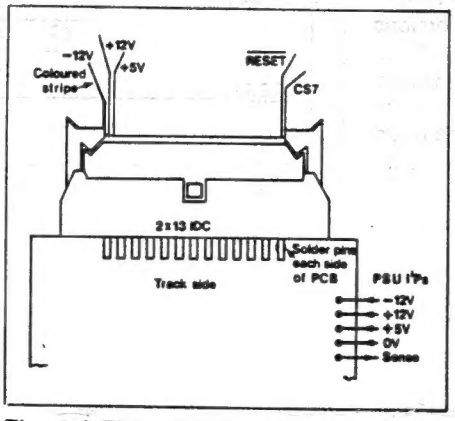


Figure 4. Fixing 2x13-Way Header to PCB

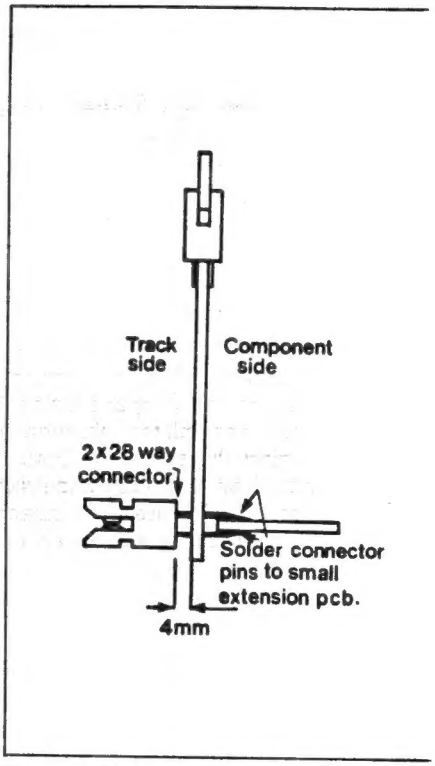
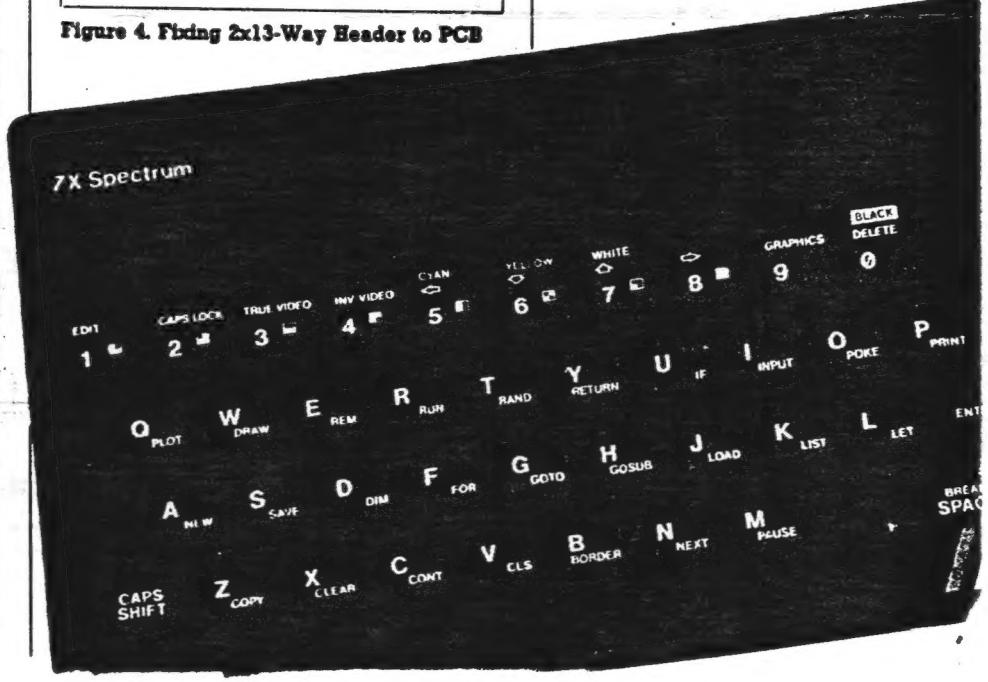


Figure 5. Fixing 2x28-Way Edge Connecto



Testing the Module

Refer to Figures 3, 4 and 8 for testing. You will again need the services of a good multimeter, a length of hook-up wire and a diode, which should be left over after construction.

Solder two short lengths of wire to each end of the diode as in figure 8 and strip, then tin the opposite ends.

With PSU disconnected, plug the I/O controller module into the Spectrum expansion port. Turn on the power and check the usual start-up routine and cursor appears. Now try all keyboard operations and make sure they function normally; if not, switch off immediately and remove the module. In this case, take out all IC's and re-insert the module – repeat the same check as before. The most common cause of problems is usually due to incorrect assembly and soldering, so if the Spectrum functions O.K. with the IC's out, then one or more of them may be suspect.

Set the multimeter to read 5V DC and connect with the negative lead attached to the heatsink of REG1 (OV) and positive lead to REG1 output pin, marked with an arrow. Expect a reading of +4.9 to +5.1V on the supply rail. Remove the meter.

Type in PROGRAM 1 and RUN it.

Each 1 of 8 ports will be addressed and the DATA bus read. The left hand column lists each port and the right hand shows the data read which, for this test, should be &H FF (255) for every port address.

ENTER NEW and type in PROGRAM 2.

RUN this program, input address 223 and data received will be displayed as zero, in the right hand column opposite. Take the test diode and connect the cathode (K) to CS7 – port address 223 – and the anode (A) to PD0. Figure 3 details the appropriate IDC terminals. A new data reading of 1 should be displayed, due to the CS7 select line going low and pulling data line PD0 low with it. In fact, the data is inverted and is really 254 as

```
PROGRAM 1

10 FOR I=31 TO 255 STEP 32
20 PRINT I,IN I
30 NEXT I
```

```
PROGRAM 2

10 CLS:RESTORE 200
20 PRINT "ADDRESS";
30 PRINT TAB 10;"SELECT(CS)";
40 PRINT TAB 23;"DATA":PRINT
50 FOR I=1 TO 8:READ a,cs
60 PRINT TAB 2;a;
70 PRINT TAB 15;cs;
80 PRINT TAB 21;"********"
90 PRINT:NEXT I
100 INPUT "ENTER ADDRESS";p
110 RESTORE 200
120 FOR J=1 TO 8:READ a,cs
130 IF p=a THEN GOTO 150
140 NEXT J:GOTO 100
150 IF INKEY$<>"" THEN GOTO 150
160 PRINT AT 21,0;"PRESS ENTER TO CHANGE ADDRESS"
170 PRINT AT INT(P/16)+1,23;255-IN p;"**"
180 IF INKEY$=CHR$ 13 THEN GOTO 10
190 GOTO 170
200 DATA 31,1,63,2,95,3,127,4,159,5,191,6,223,7,255,8
```

```
PROGRAM 3

10 CLS
20 FOR J=31 TO 255 STEP 32
30 FOR I=0 TO 255
40 PRINT AT 5,7;"PORT =";J
50 PRINT "DATA =";I
60 OUT J,I
70 PAUSE 10
80 NEXT I:CLS
90 NEXT J:PRINT "END"
```

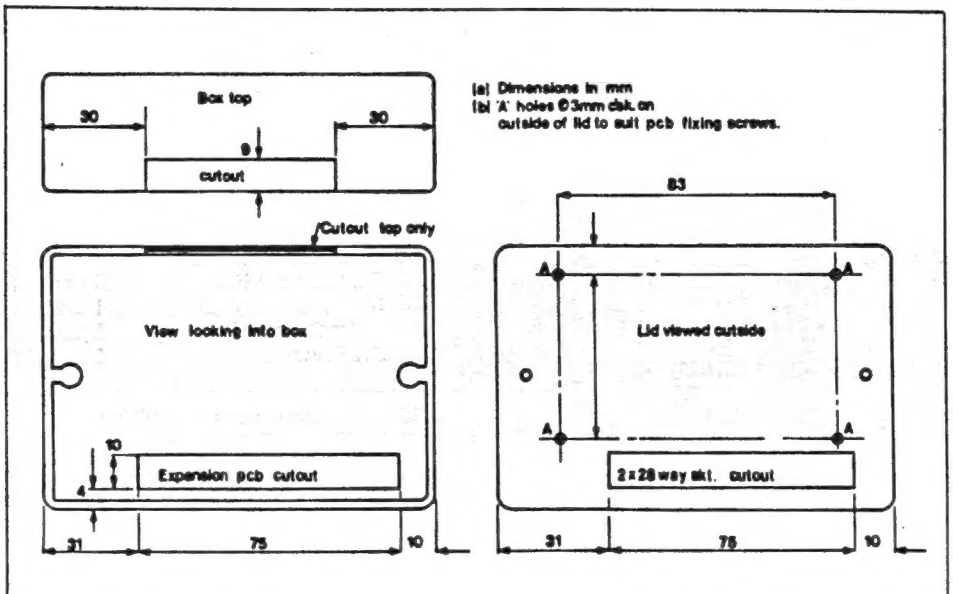


Figure 6. Box Cutting Details

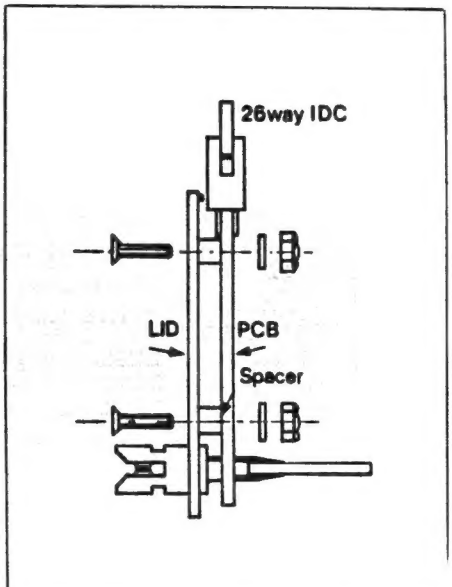


Figure 7. Fixing PCB into Box

PD1 to PD7 are all pulled high by resistors R1 – R8, thus returning 255 – 1. Line 170 in the program inverts data readings for clarity during testing. Removing the test diode from PD0 will cause data to return to 0. Repeat this test on the remaining seven data lines PD1 to PD7 using CS7 only, checking for data 2, 4, 8, 16, 32, 64 and 128. All combinations from 0 to 255 can be found by joining different data lines together and connecting to CS7 as required. Press ENTER and input a new port address from the list. Again repeat previous tests with the test diode connected to the selected CS pin until all eight addresses and CS lines have been checked. Only data input to the port is read in while running program 2 and a good indication of correct operation results in doing this. However, data output should also be checked but this operation is not quite as easy. To test port WRITE requires additional hardware in the form of latching registers and LED's, and figure 9 shows a suitable circuit of this type. Data placed at the 74LS374 inputs is clocked into the latch during the WRITE cycle and appears at the Q outputs. Sending out data codes 0 – 255 will bring on the appropriate combination of LED'S at this time but not during the read cycle. PROGRAM 3 can be used with Figure 9, with c.c.t connected to the I/O module where each port and data code will be set up.

External PSU

As mentioned before, external power source connections can be brought into the I/O PCB and hence to the IDC plug. Note that these supplies do not drive the module at all. +12V, −12V, +5V and 0V inputs are available which can be extended to peripheral devices along the IDC cable and connector. Also Figure 10 shows a simple application for disabling or enabling these power rail connections when turning the Spectrum off or on – this being useful for preventing false triggering or even damage from occurring.

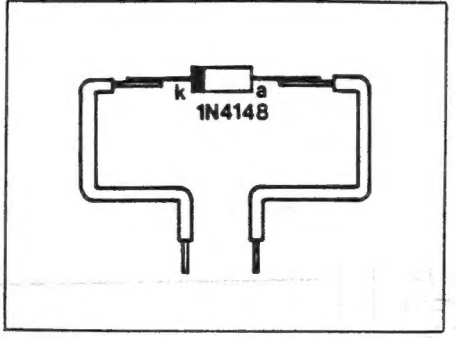


Figure 8. Test Diode

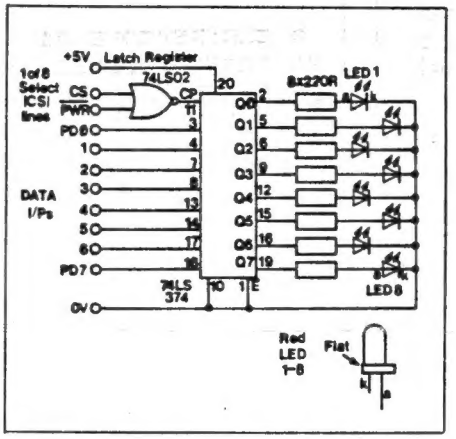


Figure 9. Additional Circuit to Test WRITE Function

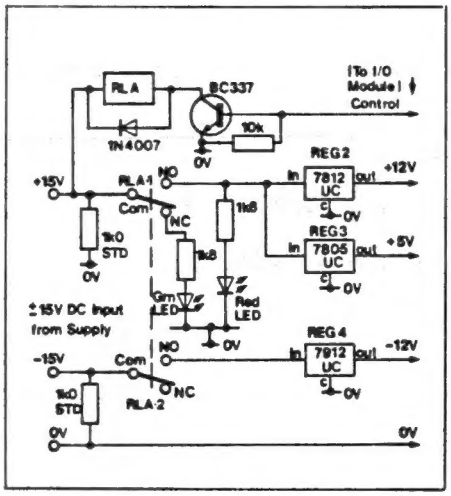


Figure 10. Circuit For External PSU

Further Expansion

Additional modules designed to be used with the controller module will be available, such as a parallel/serial system for communications applications; a sound/speech generator with amplifier and speaker and a 4-channel PWM servo/motor drive module. Some of these projects can be found in this issue and others will appear in future editions.

Interface 1

The I/O module should function normally with Interface 1 although this cannot be guaranteed in every case. We have found that some series 3/3B 48K machines do not tolerate extra 'add on's' especially when the ZX printer is attached, possibly due to excessive loading on the PSU.

Fitting into a case

Should it be required to enclose the module, and it is highly recommended this be done, Figures 6 and 7 give the necessary cutting and drilling details for the box. There are 3 cut-outs to be made and 4 holes to be drilled in the lid for mounting the PCB. Use 4 ⅛in 6BA spacers, bolts and nuts for this purpose. Fitting a 5-pin DIN plug into the box sidewall will allow a neat connection for an external PSU, if required, or perhaps a larger box could be used for containing both the PSU and the I/O module.

Final Hints

Control lines CS1 – 8, $\overline{PRD}$ and $\overline{PWR}$ are all active low (0V). Use CS to select the peripheral device and $\overline{PRD}$/$\overline{PWR}$ to enable Tri-state buffers on the data bus. Remember to connect the common 0V line as well! Only the addresses in TABLE 1 are decoded so if you are using several different modules as well as this module, check what codes can be used without clashing with any others.

SPECTRUM I/O CONTROLLER PARTS LIST

RESISTORS: All 0.4W 1% Metal Film			
R1-9	4k7	9	(M4K7)
CAPACITORS			
C1	100µF 10V Axial Electrolytic	1	(FB48C)
C2,3,4	100µF 25V P.C.Electrolytic	3	(FF11M)
C5,6,7	100nF Minidisc	3	(YR75B)
SEMICONDUCTORS			
D1,Test	IN4148	2	(QL80B)
IC1	74LS30	1	(YF20W)
IC2	74LS138	1	(YF53H)
IC3	74LS244	1	(QQ96L)
IC4	74LS32	1	(YF31X)
IC5	74LS245	1	(YF91Y)
REG 1	µA78M05UC	1	(QL26F)

MISCELLANEOUS			
PL1	26-Way IDC Header	1	(FJ15R)
SK1	2 x 26-Way Edge Connector	1	(FG23A)
	14-pin DIL Skt	2	(BL15U)
	16-pin DIL Skt	1	(BL16V)
	20-pin DIL Skt	2	(HQ77J)
	Veropin 2141	1 pkt	(FL21X)
	Spectrum I/O Controller PCB	1	(GB80B)
	Spectrum I/O Pin Ext PCB	1	(GB81C)
	6BA C/S Screws x ½in	1 pkt	(LR00A)
	6BA Nut	1 pkt	(BF19V)
	6BA x ½in Spacer	1 pkt	(LR89A)
	Box PB1 Black	1	(LH14Q)

A kit of the above parts is available.
Order As LK65V (Spctrm I/O Cntrlr Kt) Price £17.95

The following are also available separately, but do not appear in the 1985 catalogue:
Spectrum I/O Controller PCB Order As GB80B Price £5.75
Spectrum Pin Extension PCB Order As GB81C Price £1.85

ATTENTION LIST Subscribers: When it is time to renew your membership, (look at your mailing label), please make out your check to Harvey Rait, LIST President or to Robert Malloy, Treasurer. PLEASE DO NOT MAKE OUT YOUR CHECK to LIST. Our bank requires a large amount of money in a savings account in order to cash checks. THANK YOU!

Harvey Rait
5 Peri Lane,
Valley Stream, NY 11581

Robert Malloy
412 Pacific Street,
Massapequa Park, NY 11762

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Bob Malloy, LIST Treasurer

WHO'S ONLINE

Some of us here at LIST have been wondering how many of our members are using modems with their Sinclair computers. It would be helpful if those of you who are into communications would take a few minutes to let us have the following info.

COMPUTER USED .....
COMMS PRGRM .....
BAUD RATE .....
EMAIL ADDRESS.....
ONLINE SERVICES USED.....
SUGGESTIONS FOR LIST.....

You can reply to me at either of the following addresses:
74776.2342@compuserve.com
bmalloy@chelsea.ios.com (Internet)

Or, you can use our snailmail address.

Bob Malloy

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